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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/689,100	10/21/2003	Mark H. Shipton	117396	3816
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EXAMINER				
MILLER, MICHAEL G				
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/689,100

Applicant(s)

SHIPTON ET AL.

Examiner

MICHAEL G. MILLER

Art Unit

1792

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10 OCT 2008.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-12 and 23 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-12 and 23 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/CDC)
- 4) ☐ Interview Summary (PTO-413)
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____
- Paper No(s)/Mail Date _____

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

- 1) A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 10 OCT 2008 has been entered.

Response to Amendment

- 2) Examiner notes the amendments to the claims. These amendments do not introduce new matter and are therefore accepted.

Response to Arguments

- 3) Applicant's arguments with respect to the rejection(s) of claim(s) 1-12 under 35 U.S.C. 103(a) have been fully considered and are persuasive, as the original rejections do not explicitly teach the use of the formed product in a high temperature corrosive environment. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Klotz and Bomberger, citing Nguyen-Dinh and Jackson et al (full citations below) as evidence of fulfilled claim limitations.

Claim Rejections - 35 USC § 103

- 4) The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:
- a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.
- 5) Claims 1-9, 11-12 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Klotz (U.S. Patent 3,395,027, hereinafter '027) in view of Bomberger et al (U.S. Patent 3,434,813, hereinafter '813). Nguyen-Dinh (U.S. Patent 5,908,516, hereinafter '516) and Jackson et al (U.S. PGPub 2003/0082053, hereinafter '053) are supplied as evidence.
- 6) With regard to Claim 1, '027 teaches a method of coating a substrate, the method comprising:
- a) Applying to the substrate a coating comprising a source of a ceramic-forming metal oxide (Column 2 Lines 22-34) and a source of a phosphate binder for the metal oxide (Column 2 Lines 40-62), and
- b) Causing the metal oxide and the phosphate to cure to form a diffusion barrier comprising a phosphate bonded ceramic on the titanium alloy substrate (Column 3 Line 49 – Column 5 Line 11).

- c) '027 does not explicitly teach a titanium alloy substrate, though it does teach applying its coatings to metal substrates which are subject to deterioration by water, salt spray or the like (Column 1 Lines 19-29).
- d) '813 teaches that titanium-base alloys are subject to deterioration by salt-containing compounds such as ocean spray, chlorinated solvents or fingerprint residues at elevated temperatures (Column 1 Lines 26-31).
- e) Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to have modified the coating method as taught in '027 to coat a titanium alloy substrate as taught in '813 because '027 teaches a method of coating suitable for metals subject to deterioration in salt-containing environments and '813 teaches that titanium alloy is subject to deterioration in salt-containing environments at elevated temperatures.
- f) '813 further teaches that the titanium alloy substrate comprises carbon (Column 2 Lines 47-56).
- g) '027/'813 do not teach that the substrate is configured to be used in corrosive environments above 650 degrees Celsius. '813 teaches that supersonic aeronautical conditions and applications are likely to expose titanium alloys to corrosive conditions (Column 1 Lines 26-31). '516 teaches that is known to fabricate gas turbine engine components from titanium alloys (Column 4 Lines 56-61); '053 teaches that standard operating temperatures of gas turbine engine components are between 1000 and 1200 degrees Celsius (PG 0023). Based on the teachings of '516 and '053, a person having ordinary skill in the art at the time

the invention was made would have reasonably expected the product of '027/'813 to be used in a corrosive environment at temperatures exceeding 650 degrees Celsius.

- 7) With specific regard to Claim 2, which includes all the limitations of Claim 1 above, '027/'813 teaches a method according to Claim 1, wherein:

a) The coating is applied in one step ('027 Column 3 Lines 49-53).

- 8) With specific regard to Claim 3, which includes all the limitations of Claim 1 above, '027/'813 teaches a method according to Claim 1, wherein:

a) The coating is applied as an acidic aqueous medium comprising the oxide source and the phosphate source ('027 Column 2 Lines 5-9).

- 9) With specific regard to Claim 4, which includes all the limitations of Claim 1 above, '027/'813 teaches a method according to Claim 1, wherein:

a) The oxide source is selected from oxides and hydroxides of magnesium, aluminium, iron, chromium, sodium, zirconium and calcium, and any mixture or chemical or physical combination thereof ('027 Column 3 Lines 14-46, all examples teach magnesium and chromium oxides or combinations thereof).

- 10) With specific regard to Claim 5, which includes all the limitations of Claim 1 above, '027/'813 teaches a method according to Claim 1, wherein:

a) The phosphate source is selected from phosphoric acid and phosphates of potassium, aluminium, ammonium, beryllium, calcium, iron, lanthanum, lithium, magnesium, magnesium-sodium, magnesium-potassium, sodium, yttrium, zinc,

zirconium, and any mixture or chemical or physical combination thereof ('027 Column 3 Lines 14-46, all examples teach phosphoric acid or magnesium dihydrogen phosphates).

11) With specific regard to Claim 6, which includes all the limitations of Claim 4 above,

'027/'813 teaches a method according to Claim 4, wherein:

- a) The oxide source is selected from magnesium oxide, chromium oxide and mixtures thereof ('027 Column 3 Lines 14-46).

12) With specific regard to Claim 7, which includes all the limitations of Claim 3 above,

'027/'813 teaches a method according to Claim 3, wherein:

- a) The acidic aqueous medium further comprises one or more optional additional ingredients ('027 Column 3 Lines 14-46, all examples contain nitric acid and aluminum particles).

13) With specific regard to Claim 8, which includes all the limitations of Claim 7 above,

'027/'813 teaches a method according to Claim 7, wherein:

- a) The one or more optional additional ingredient is selected from one or more of rheology modifiers, buffers, pH reducers, oxidising agents, reducing agents, other cure retardants and surfactants ('027 Column 3 Lines 14-46, wherein nitric acid is a pH reducer and aluminum powder is a rheology modifier which will thicken the solution by its presence).

14) With specific regard to Claim 9, which includes all the limitations of Claim 3 above,

'027/'813 teaches a method according to Claim 3, wherein:

- a) The acidic aqueous medium consists essentially of the oxide source, the phosphate source, water, and optionally one or more of rheology modifiers, buffers, pH reducers, oxidising agents, reducing agents, other cure retardants or surfactants, with less than about 10% by weight of other ingredients ('027 Column 3 Lines 14-46, by above interpretations there is 0% by weight of other ingredients as the nitric acid and aluminum particles are a pH reducer and rheology modifier respectively).
- 15) With specific regard to Claim 11, which includes all the limitations of Claim 1 above, '027/'813 teaches a method according to Claim 1, wherein:
- a) The coating is applied in a thickness of up to about 25 μm ('027 Column 4 Lines 12-16; .0005in = 12.7 μm).
- 16) With specific regard to Claim 12, which includes all the limitations of Claim 1 above, '027/'813 teaches a method according to Claim 1, wherein:
- a) Curing of the coating is initiated by heating the coating ('027 Column 3 Line 49 – Column 5 Line 11)
- 17) With specific regard to Claim 23, which includes all the limitations of Claim 1 above, '027/'813 teaches a method according to Claim 1, except for the following limitation:
- a) The diffusion barrier has a thickness in the range of about 1 to about 10 micrometers.
- b) Both '027 and '813 teach diffusion barrier coatings of 0.0005 inches (12.7 micrometers) ('024 Column 4 Lines 12-16, '813 Column 2 Lines 39-42). '813 teaches that the thickness of the surface coating is dependent on the intended

application in the same citation. Further, any thickness of surface coating will provide a degree of corrosion resistance. It has been settled that a *prima facie* case of obviousness exists where the claimed ranges and prior art ranges do not overlap but are close enough that one skilled in the art would have expected them to have the same properties. *Titanium Metals Corp. of America v. Banner*, 778 F.2d 775, 227 USPQ 773 (Fed. Cir. 1985). (MPEP 2144.05.I.)

18) Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over '027/'813 in view of Mosser et al (U.S. Patent 5,803,990, hereinafter '990), Trocynski et al (U.S. PGPub 2002/0107133, hereinafter '133) and Wydra et al (U.S. Patent 3,857,717, hereinafter '717).

19) With specific regard to Claim 10, which includes all the limitations of Claim 1 above, '027/'813 teaches a method according to Claim 1, wherein:

- a) The coating is applied as substantially the following composition (Column 3 Lines 32-39, Example 3):
 - i) Water
 - ii) Phosphoric acid
 - iii) Chromium trioxide
 - iv) Magnesium oxide
 - v) Spherical aluminum particles
 - vi) Nitric acid

- b) Neither '027 nor '813 teach chromium oxide, clay or magnesium hydrogen phosphate explicitly. In addition, '027 teaches nitric acid which is not called for by Applicant.
- c) Justification For Removing Nitric Acid
 - i) '990 teaches a method of providing a protective coating to titanium alloys (Column 11 Lines 22-25). Therefore it would have been obvious to combine the method of '027/'813 with the method of '990 because both pieces of art want to apply an anti-corrosion coating to titanium alloys.
 - ii) In the related process of '990 (Column 7 Line 15 – Column 11 Line 14), boric acid is used as an additive.
 - iii) '990 requires the borate ions as provided by the aforementioned boric acid as a manner of pH adjustment (Column 5 Lines 23-25).
 - iv) Both '027 and '990 speak of adding the borate/nitrate ion to the coating solution, preferentially as an acid but acceptably as a metal salt ('027 – Column 3 Lines 63-68; '990 – Column 5 Lines 16-20). '990 also says that the pH may be lowered by adding sources of the phosphate ion including phosphoric acid and metal acid salts (Column 3 Lines 64-67). This leads to the conclusion that borate, nitrate and phosphate ions are all pH adjusters.
 - v) '027/'813 /'516/'053/'990 discloses the immediately relevant portion of the claimed invention except that '027/'813 /'516/'053/'990 has a mixture of pH adjusting ions instead of a single source (phosphates). '027/'813 /'516/'053/'990 shows that phosphate ions and nitrate ions are equivalent

structures known for this purpose in the art. Therefore, because these two ions were art-recognized equivalents at the time the invention was made, one of ordinary skill in the art would have found it obvious to substitute phosphate ions for nitrate ions and thereby to add phosphate ion-producing chemicals in place of nitric acid.

d) Justification For Including Magnesium Hydrogen Phosphate

- i) '027 teaches the use of metal phosphates as a means to introduce metal and phosphate ions to the solution (Column 2 Lines 54-60). Magnesium hydrogen phosphate meets this definition as a monobasic phosphate of magnesium (one OH^- group).
- ii) H_3PO_4 and MgHPO_4 serve the equivalent function of providing PO_4^{3-} ions into solution. Therefore, it would have been obvious to add MgHPO_4 to the mixture of '027/813 /'516/'053; "It is *prima facie* obvious to combine two compositions each of which is taught by the prior art to be useful for the same purpose, in order to form a third composition to be used for the very same purpose.... [T]he idea of combining them flows logically from their having been individually taught in the prior art." *In re Kerkhoven*, 626 F.2d 846, 850, 205 USPQ 1069, 1072 (CCPA 1980).

e) Justification For Including Chromium(III) Oxide

- i) '133 teaches a method of providing a phosphate-bonded ceramic coating to a titanium-alloy substrate for corrosion-protection properties (PG 0060).

- ii) Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to have combined the method of '027/813 with the method of '133 because both methods want to provide a corrosion protective coating to a titanium alloy substrate.
 - iii) '133 teaches methods of providing a phosphate-bonded ceramic coating using Cr_2O_3 as the oxide source (PG 0039-0040, 0060).
 - iv) CrO_3 and Cr_2O_3 serve the equivalent function of providing Cr ions into solution. A mixture of these compounds in solution is obvious for the same reasons as in the previous section.
- f) Justification For Including Clay
- i) '027/813 teaches adding aluminum powder to protect against corrosion (Column 2 Lines 12-16).
 - ii) '717 teaches adding kaolin powder, a clay mineral also known as kaolinite, to a phosphate-bonded chromium ceramic coating for its chemical resistance, i.e. resistance to corrosion (Column 2 Lines 27-52). Kaolinite's chemical structure is $\text{Al}_2\text{Si}_2\text{O}_5(\text{OH})_4$, which includes aluminum.
 - iii) Aluminum powder and kaolinite are both shown to be suitable for providing corrosion resistance. Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to use kaolinite in place of aluminum powder because the selection of something based on its known suitability for its intended use has been held to support a

prima facie case of obviousness. *Sinclair & Carroll Co. v. Interchemical Corp.*,
U.S. 327, 65 USPQ 297 (1945).

g) Concentrations

- i) The combination of '027/990/133/717, as rendered obvious above, shows the claimed mixture but is silent as to the concentrations.
- ii) Generally, differences in concentration or temperature will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such concentration or temperature is critical. "[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to MICHAEL G. MILLER whose telephone number is (571)270-1861. The examiner can normally be reached on M-F 7-4.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tim Meeks can be reached on (571) 272-1423. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Michael G. Miller/
Examiner, Art Unit 1792

/Timothy H Meeks/
Supervisory Patent Examiner, Art Unit 1792